

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

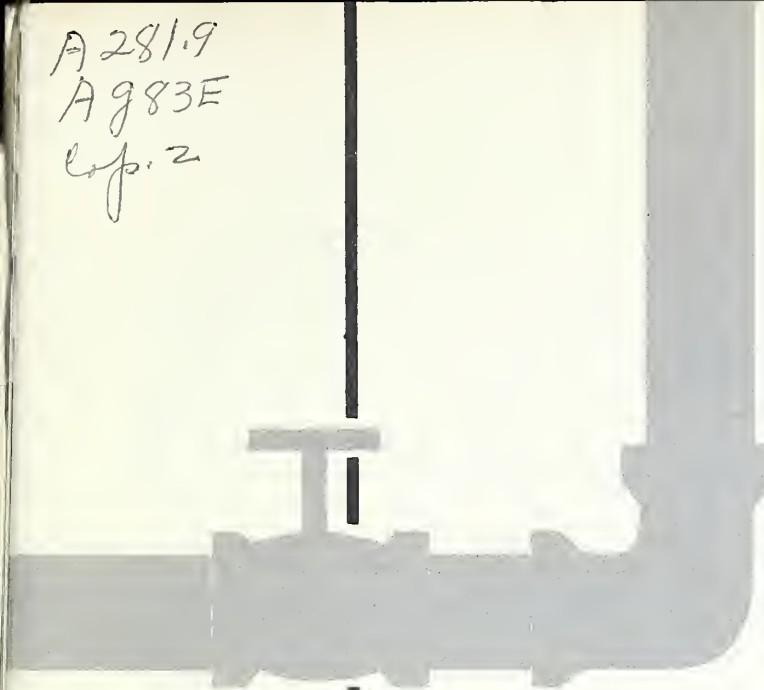


A 281.9
A 983E
cop. 2

U.S. DEPARTMENT OF AGRICULTURE
NATIONAL RESEARCH COUNCIL LIBRARY

JUL 17 1963

CURRENT SERIAL RECORD



IRRIGATION ENTERPRISES IN NORTHEASTERN COLORADO

ORGANIZATION,
WATER SUPPLY, COSTS

ERS-117

CONTENTS

	Page
Summary	iii
Introduction	1
Areas Served by Irrigation Enterprises	5
Company stock issues	5
Acres served by shares of stock	6
Water Deliveries Within Irrigation Enterprises	6
Deliveries per share	6
Deliveries per acre	8
Deliveries from reservoir companies	9
Annual Cost of Irrigation Water	10
Delivery costs and company size	10
Delivery costs in relation to quantity	11
Cost of reservoir company water	12
Market Prices of Irrigation Company Stock	14
Summary Evaluation of Irrigation Enterprises	16
Literature Cited	18

June 1963

SUMMARY

Irrigation development in the South Platte Basin has largely been by private organizations. There are well over 100 such enterprises operating in Boulder, Larimer, Weld, and Morgan Counties, Colorado. A large number of enterprises in an area provides an opportunity for realistic comparisons in their manner of operation. This report generally describes the variation in size of operation, costs of water delivery, and market value of water among the 106 irrigation enterprises in the area. The basic information in this report has been useful in studying the value of irrigation water as estimated from farm sale values and also in analyzing the water rental market.

The total area irrigated by these enterprises is about 720,500 acres, from a long-time average annual water supply of 888,000 acre-feet of natural streamflow and over 260,000 acre-feet of water stored in reservoirs. The area annually receives an additional 180,000 to 290,000 acre-feet of supplemental water from the Northern Colorado Water Conservancy District (NCWCD). The data given in this report do not include the NCWCD water, as most of it is allocated to individual users rather than to irrigation enterprises.

The land served per irrigation enterprise ranges from 140 to 55,000 acres. Stock issues vary from 8 to 10,000 shares per company. A share of stock provides water to a minimum of 0.3 acre to a maximum of 160 acres of land. About 60 percent of the shares provide water to less than 20 acres.

The amount of water delivered to individual stockholders is proportional to stock held, rather than to acres of irrigated land under the system.

Reservoir companies usually supply water to a number of irrigation companies. Almost 95 percent of the reservoir companies allocate less than 20 acre-feet per share; individual reservoir deliveries range up to 33,000 acre-feet.

Annual assessment charges on irrigation water vary with the amount of water supplied per acre and the size of the area serviced. Generally, enterprises with the largest service areas deliver the smallest amount of water per acre. Those delivering up to 1 foot per acre serve areas of over 15,000 acres; their assessment charges average \$1.14 per acre-foot. The companies delivering over 3 feet per acre assess an average of 34 cents per acre-foot delivered and have service areas averaging 2,500 acres. Reservoir water assessments average \$2.05 per acre-foot, and range from 21 cents to \$6.49 per acre-foot.

Market prices of irrigation stock in the area are quoted all the way from \$10 to \$15,000 per share. The market value of water stock in companies serving less than 1,000 acres averages \$5.40 for the annual delivery of one acre-foot. Companies serving between 1,000 and 3,000 acres have an average market value for water of \$17 per acre-foot delivered annually. In companies with service areas of 3,000 to 13,000 acres, the average value of water is \$27. For companies serving more than 13,000 acres, water stock is valued at an average of \$40.23 per acre-foot delivered annually.

Irrigation enterprises in this region are organized mainly as farmer-owned mutual companies and are fairly responsive to the wishes of the water users. There appear to be many more enterprises than necessary to provide water service to the irrigated land in the area. However, the absence of pressure to reduce delivery costs or to become more efficient in water use, coupled with the legal difficulty of changing diversion points, makes consolidation of systems unlikely in the foreseeable future.

IRRIGATION ENTERPRISES IN NORTHEASTERN COLORADO
Organization, Water Supply, Costs

By

Raymond L. Anderson, Agricultural Economist
Resource Development Economics Division
Economic Research Service

INTRODUCTION

This report is concerned with the water supply and financial characteristics of irrigation enterprises located in Boulder, Larimer, Morgan, and Weld Counties in the South Platte Basin of northeastern Colorado. Its primary purposes are to see what differences exist in operation and cost of water between enterprises in a particular geographic area, and to provide much-needed data on the annual cost to farmers of water actually delivered. This report derives from current research in northeastern Colorado on the irrigation water rental market (1) and the value of irrigation water as estimated from farm sales data (2). 1/

Earlier research studies by Hutchins, Selby, and Voelker (4 to 7) have described the various organizational forms taken by irrigation enterprises but none have analyzed the actual diversity in the financial structure and operations of enterprises located in a single area. The decennial Census of Irrigation (8) provides detailed information of this nature but does not relate quantities and costs of water delivered. This report attempts to fill this information gap for an important irrigated area. All data herein refer to available irrigation water exclusive of that provided through the Northern Colorado Water Conservancy District (NCWCD). Deliveries from the Conservancy District vary considerably from year to year and, moreover, are based on individual user allotments.

Irrigation in the study area is carried on by a large number of private organizations, of several types: (1) Irrigation organizations supplying direct streamflow and reservoir water, (2) organizations supplying direct stream water only, and (3) reservoir organizations supplying only stored water to one or more irrigation systems. Most of the organizations are farmer-owned, mutual companies incorporated under State charter, and organized for the express purpose of supplying irrigation water.

Although mutual irrigation companies are variously called "irrigation companies," "ditch companies," and "canal and reservoir companies," they are

1/ Underscored numbers in parentheses refer to items in the Literature Cited, p. 18.

all voluntary associations of irrigation farmers operating on a nonprofit basis. Stock in the mutual irrigation companies is held by the water users. Officers normally include a president, secretary-treasurer, and board of directors. On the larger systems, superintendents and ditchriders are employed to maintain the system and supervise diversion of water into lateral canals and thence to individuals. Annual assessments are made against the stock to cover operation and maintenance costs and to repay investment costs. The amount of water delivered to a stockholder is in proportion to his stockholdings, rather than to the amount of irrigated land he has under the system. Shares of stock are transferable from one farm to another within systems, except in some of the smaller companies.

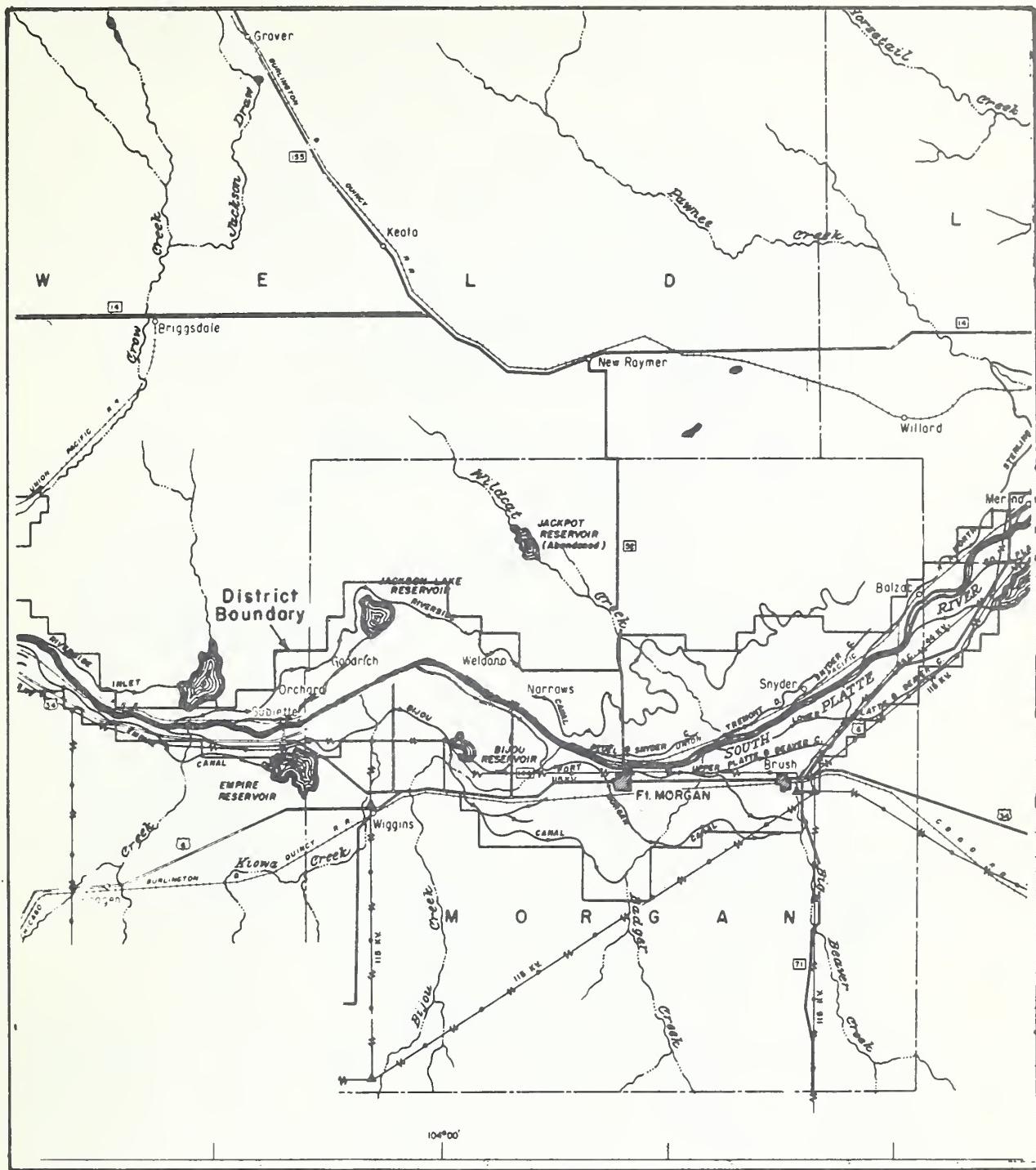
The alternative method of organizing an irrigation enterprise in this area is the irrigation district, which is a public or quasi-municipal corporation organized under State laws for the purpose of providing a water supply for the irrigation of lands. The principal advantage of the irrigation district organization is its legal power to finance capital improvements by issuing bonds or to obtain other revenues from tax assessments on district lands. Mutual companies traditionally have had limited financing ability.

Irrigation districts were found to provide water in three ways. Two districts were organized to improve existing systems and provide supplemental water; one was organized to carry out new irrigation development; and another was organized to buy stock in a mutual reservoir company which provides supplemental water to an existing mutual irrigation system.

The irrigation enterprises discussed in this study are in parts of State Water Districts 1 through 6 in northeastern Colorado. Figure 1 shows the ditch systems in Morgan County, Colo. Figure 2 shows the major ditches within the NCWCD boundaries in Boulder, Weld, and Larimer Counties. Some of the water district boundaries extend beyond the 4-county area, but only those enterprises lying within the 4-county area are included in this report. Some small companies within this area are not included, however, because comparable data were not readily available.

Private irrigation enterprises have considerable freedom in the way they organize and function. They can serve a few farmers or hundreds, and the areas they serve vary greatly in size. A share of stock can represent water service to less than 1 acre or to a quarter section. Similarly, water deliveries per share can be a fraction of an acre-foot or more than 100 acre-feet. The market value of a share of stock can be a few dollars or thousands of dollars. This report shows the diversity attained by irrigation organizations in a relatively small area. The study is based on a population of 106 enterprises--83 mutual irrigation companies, 19 reservoir companies, and 4 irrigation districts.

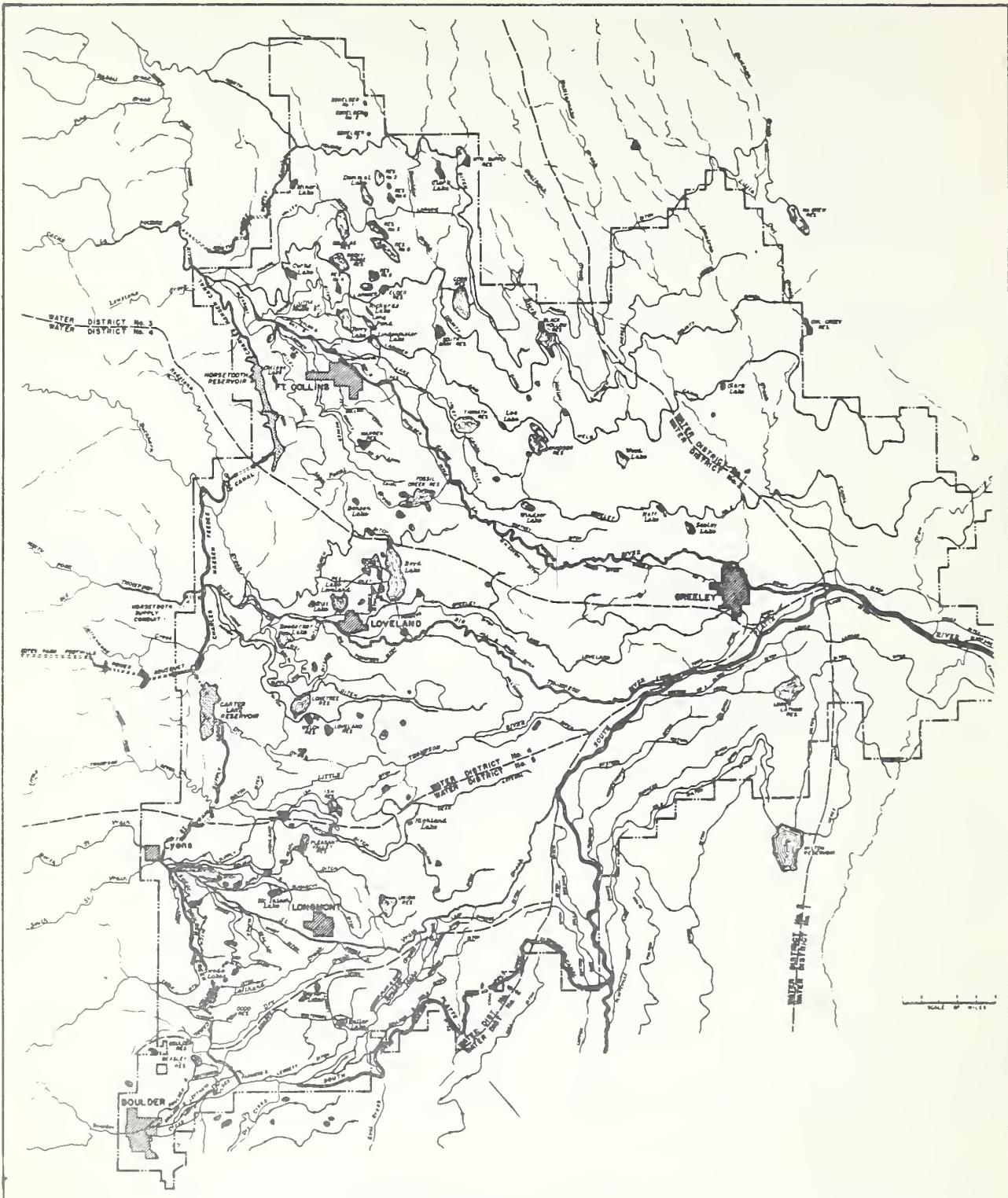
Many of the data were found to be available at more than one source, in more than one place, and thus were checked for consistency. The records of the NCWCD contained most of the information--particularly on the larger irrigation organizations. District Water Commissioners provided water-delivery records on many small ditch and reservoir companies. Secretaries



U.S. Department of Agriculture

Neg. ERS-2012-63 (5) Economic Research Service.

Figure 1.--Eastern part of Colorado State Water District 1. (Map from Bureau of Reclamation, U. S. Department of the Interior.)



U.S. Department of Agriculture

Neg. ERS 2013-63 (5) Economic Research Service

Figure 2.--Western part of Colorado State Water District, and all of Districts 2 to 6. (Map from Bureau of Reclamation, U. S. Department of the Interior.)

of many companies were interviewed to get additional information on company operations. Records of the Federal Land Bank at Wichita also provided information on many small companies in the 4-county area.

AREAS SERVED BY IRRIGATION ENTERPRISES

The service areas of individual irrigation enterprises in this section of the South Platte Basin range from 140 acres to 55,000 acres. About 60 percent of the companies serve less than 5,000 acres each, and cover only 13 percent of the total area. Slightly over 36 percent of the enterprises serve areas ranging from 5,000 to 40,000 acres and serve about 63 percent of the area. The largest enterprises, with service areas between 40,000 and 55,000 acres, constitute 3.5 percent of the companies but serve 23.5 percent of the area (table 1).

Table 1.--Service areas of 86 irrigation enterprises, by size of enterprise, State Water Districts 1 - 6, South Platte Basin, Colo., 1960

<u>Size of enterprise:</u> <u>(service area)</u>	<u>Enterprises</u>	<u>Area served</u>		
<u>Acres</u>	<u>Number</u>	<u>Acres</u>	<u>Percent</u>	<u>Percent</u>
Under 500	8	2,735	9.3	0.4
500 - 999	6	4,973	7.0	.7
1,000 - 2,999	26	45,347	30.2	6.3
3,000 - 4,999	12	45,096	14.0	6.3
5,000 - 9,999	10	68,630	11.6	9.5
10,000 - 19,999 ...	15	206,922	17.4	28.7
20,000 - 39,999 ...	6	177,325	7.0	24.6
40,000 and over ...	3	169,525	3.5	23.5
Totals	86	720,553	100.0	100.0

Company Stock Issues

Stock outstanding in 101 of the companies studied ranges from 8 shares to over 10,000 shares (table 2). One company and the 4 irrigation districts do not issue stocks. There are 24 companies with less than 100 shares of stock outstanding; 52 have between 100 and 1,000 shares; and 20 have between 1,000 and 5,000. Only 2 companies have 5,000 to 10,000 shares outstanding, and 3 have over 10,000 shares. The number of shares of stock issued by a particular company depends on many complex financial and operating requirements, an important one of which is the total irrigated area it services.

Table 2.--Shares of irrigation stock outstanding,
 106 mutual irrigation and reservoir companies
 in State Water Districts 1 - 6, South Platte
 Basin, Colo., 1960

Shares of stock	:	Number of companies
None	:	5
1 - 99	:	24
100 - 499	:	36
500 - 999	:	16
1,000 - 4,999	:	20
5,000 and up	:	5
Total	:	106

Acres Served by Shares of Stock

Irrigation companies normally specify the number of acres supposedly served by a share of stock. The total acreage nominally irrigated by some companies has changed over time as knowledge of the actual water supply improved and as the system expanded.

The acreage served per share of stock varies widely in the 83 mutual companies studied--from 0.3 acre per share to 160 acres per share. In about one-fifth of the companies, a share serves less than 5 acres; in another fifth a share serves 5 to 10 acres; and in another fifth a share serves from 10 to 20 acres. In over 60 percent of the companies then, a share serves less than 20 acres. Shares serve between 20 and 30 acres in 13.4 percent of the companies and 30 to 60 acres in 13.3 percent of the companies. In only 11 percent of the companies do single shares serve over 60 acres (fig. 3).

WATER DELIVERIES WITHIN IRRIGATION ENTERPRISES

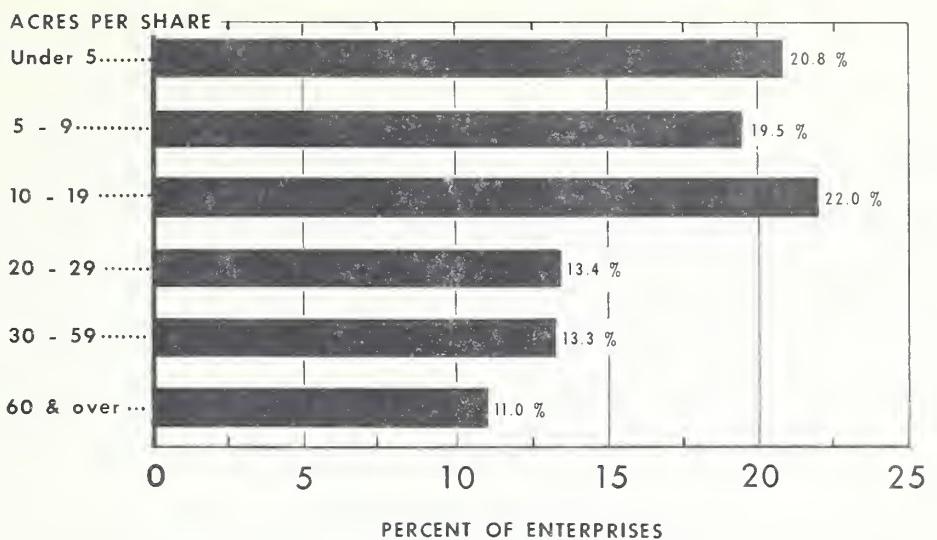
Water deliveries within mutual irrigation companies in the study area can be expressed in two ways: (1) By the number of acre-feet delivered per share; and (2) by the average number of acre-feet delivered per acre under the system. Since practically all companies issue stock and shares of stock may not be evenly distributed over the service area, the number of acre-feet delivered per share and the number of shares of stock owned by the farmer combine to determine the irrigation water supply on an individual farm.

Deliveries Per Share

Some companies allocate as little as 0.4 acre-foot per share, and a few allocate between 400 and 600 acre-feet per share. Figure 4 indicates that

AVERAGE ACRES IRRIGATED PER SHARE OF STOCK

82 Irrigation Enterprises - South Platte Basin, Colorado, 1960



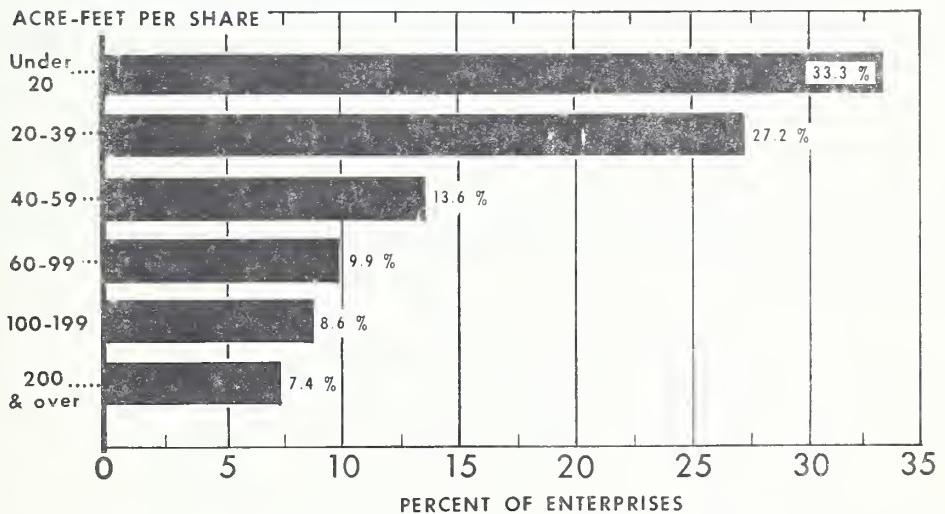
U. S. DEPARTMENT OF AGRICULTURE

NEG. ERS 2014-63 (5) ECONOMIC RESEARCH SERVICE

Figure 3

ACRE-FEET OF WATER DELIVERED PER SHARE OF STOCK

By Irrigation Enterprises in South Platte Basin, Colorado, 1960



U. S. DEPARTMENT OF AGRICULTURE

NEG. ERS 2015-63 (5) ECONOMIC RESEARCH SERVICE

Figure 4

about 75 percent of the companies allocate under 60 acre-feet per share, and 25 percent allocate over 60 acre-feet. Only 7.4 percent of the companies allocate over 200 acre-feet per share.

Deliveries Per Acre

On a per-acre-served basis, water deliveries in the South Platte Basin by irrigation organizations vary from an average of 0.4 foot to 6.6 feet per acre. About 38.5 percent of the organizations allocate up to 1.5 feet of water per acre and service slightly over 62.6 percent of the land area (fig. 5). Forty percent of the area receives between 1 and 1.5 feet per acre. Over 39 percent of the irrigation enterprises supply between 1.5 and 3 feet of water per acre to the land under their ditches. These organizations cover 30 percent of the total land area served by the enterprises described in this report. Twenty-two percent of the enterprises allocate over 3 feet per acre, but to only 7.2 percent of the land area. The average service area of these enterprises is 2,800 acres, but the range is from 400 acres to 7,000 acres.

About 57 percent of the enterprises deliver less than 2 feet per acre and the remaining 43 percent deliver more than 2 feet per acre. In terms of acres served, however, over 81 percent of the irrigated area is served by enterprises delivering less than 2 feet per acre. But more water than this is available if a subsidiary reservoir company runs stored water into its parent organization's water system. Moreover, some reservoir companies deliver water to more than one irrigation system, making it difficult to determine from available records the total water run through a single system.

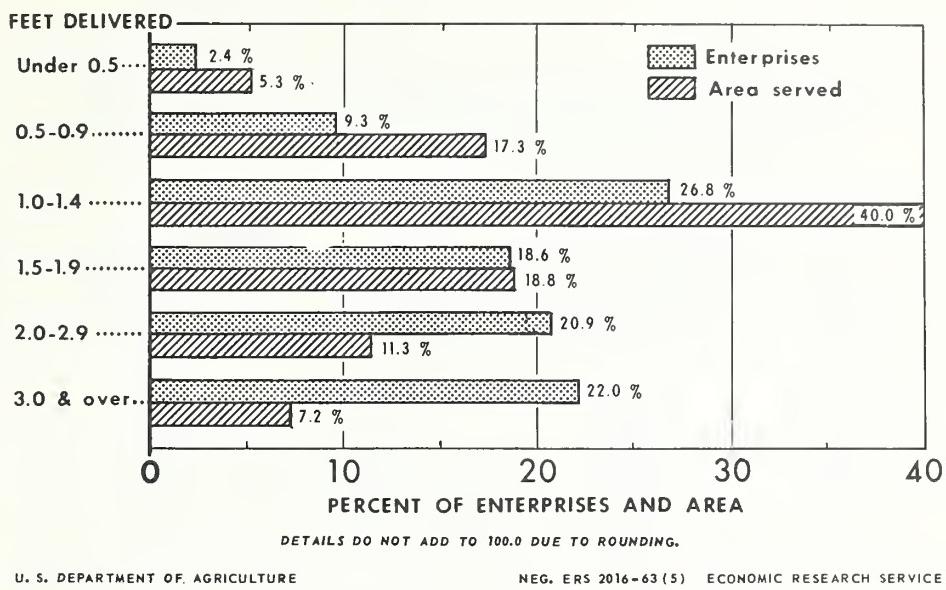
The prior appropriation system of water rights prevails in Colorado, which generally means that the first appropriator has the first legal right to continuously divert water for beneficial purposes. The older irrigation companies in the State usually developed small land areas. But they requested and the courts frequently granted rights to large quantities of water relative to the land area served.

Irrigation enterprises delivering the greatest quantities of water per acre generally have senior rights on the streams and are located near the stream bottoms. The bottomland soils are frequently sandy and gravelly with low water-holding capacity and they require large applications of water to assure crop production.

Feet-per-acre delivery figures for an entire enterprise give only a general indication of the water supply actually available on an individual farm. A farmer can have more or less than the average number of shares of water stock, and he may rely on such other sources as wells, a subsidiary reservoir company, on an allotment of NCWCD water, or on rental of either reservoir or ditch water. The acres in the system normally include farmstead sites, seeped areas, some noncultivated lands and, in some overlapping cases, service areas of adjacent companies. A number of areas are served by more than one irrigation system.

IRRIGATION WATER DELIVERED PER ACRE

By Irrigation Enterprises in South Platte Basin, Colorado, 1960.



U. S. DEPARTMENT OF AGRICULTURE

NEG. ERS 2016-63 (5) ECONOMIC RESEARCH SERVICE

Figure 5

Deliveries from Reservoir Companies

Reservoir companies supply some water to most of the large irrigation enterprises in the 4-county area. Only enterprises with old decrees on a stream can successfully irrigate through most seasons without resorting to stored water. Reservoir company deliveries in this area range from 122 acre-feet to 33,000 acre-feet. Water allocations per share of reservoir stock range between 0.47 and 38.5 acre-feet, with 13 reservoir companies allocating less than 10 acre-feet per share, 5 allocating between 10 and 20 acre-feet, and 1 allocating 38 acre-feet (table 3).

All reservoirs discussed in this study are included in one or more ditch company systems. Some enterprises have set up reservoir affiliates, with separate issues of stock. Stockholders in the parent ditch own varying amounts of the reservoir stock. Stockholders in separate irrigation enterprises often own stock in the same reservoir company. Some reservoir companies never actually deliver stored water to the stockholders, but release stored water to another ditch system in exchange for direct stream water. The Fossil Creek Reservoir of the North Poudre Irrigation Company is used primarily for this purpose. The Water Supply and Storage Company and North Poudre Irrigation Company are examples of companies that include both direct stream water and reservoir water under one issue of stock. The Larimer and Weld Irrigation Company, the Larimer and Weld Reservoir Company, and the Windsor Reservoir Company illustrate separation of reservoir supplies and direct streamflow. The New Cache La Poudre Irrigating Company, the Cache

La Poudre Reservoir Company, and several others also operate on this system. The Union Reservoir Company is an example of a company owned by water users in two separate irrigation systems. The water is not released into canals but into the river for subsequent use in the two systems.

Table 3.--Water allocation per share of stock, 19 reservoir companies, State Water Districts 1 - 6, South Platte Basin, Colo., 1960

Acre-feet of water alloca- ted per share	Reservoir companies	
	Number	Percentage
:		:
Under 5	8	42.1
5 - 9.9	5	26.3
10 - 19.9	5	26.3
Over 20	1	5.3
Total	19	100.0
:		:

ANNUAL COST OF IRRIGATION WATER

Mutual irrigation companies are nonprofit organizations. Their product--the water delivered for irrigation--is allocated equally among the outstanding shares of stock in the system, and operating expenses are correspondingly prorated among shares. These expenses include: (1) Wages of employees of the company--ditchriders, maintenance men, superintendent, and secretary; (2) costs of maintaining ditches and reservoirs; (3) outlays for purchases and maintenance of equipment; and (4) loan interest and repayment. Because most of these enterprises have been in operation for a long time, construction costs have been fully repaid, and current expenses are largely for routine operation, maintenance, and improvements. Annual assessments levied against outstanding stock usually constitute the annual cost of irrigation water to the farmer. Some companies impose an additional running charge or toll for all water run in the system; others impose a toll charge for all reservoir or other water (such as NCWCD water) not allocated to irrigation company stock. Known toll charges are included in the water costs analyzed in this report.

Delivery Costs and Company Size

The average assessment per acre-foot of water allocated to irrigation company stocks varies with the size and location of irrigation systems. Table 4 shows the average acreage served by enterprises with various assessments per acre-foot.

The larger enterprises incur and charge higher costs per acre-foot of water delivered, simply because they operate and maintain more complex and

extensive systems of canals, reservoirs, and diversion works. In smaller enterprises, much of the work of operating and maintaining the systems is performed by the water users; many of these systems do not include reservoirs.

Table 4.--Average assessment per foot of water delivered per acre, and average service area, 86 irrigation enterprises, by amount of water delivered per acre, South Platte Basin, Colo., 1960

Delivery per acre	Enterprises	Average assessment per acre-foot per enterprise	Average service area per enterprise
Feet	Number	Dollars	Acres
0.9 and under	10	.14	15,000
1.0 - 1.5	23	.16	11,090
1.6 - 2.0	16	.97	7,820
2.1 - 3.0	18	.50	4,192
3.1 - 4.0	5	.45	2,275
4.1 - 5.0	6	.35	3,320
5.1 and over	8	.34	2,067

Figure 6 shows that water assessments run below 75 cents per acre-foot for almost 50 percent of the irrigated land in the study area. This excludes water coming from separate reservoir companies. In 20 percent of the area, water assessments range from 75 cents to \$1. Slightly over 15 percent of the area is served by irrigation enterprises assessing from \$1 to \$2 per acre-foot; the remaining 14 percent of the area is served by companies assessing over \$2 per acre-foot.

Delivery Costs in Relation to Quantity

As the quantity of water delivered per acre increases, the cost per acre-foot substantially declines. Declining annual cost of water results from the fact that the total costs of operating and maintaining a given size of system tend to be the same whether 0.5 foot or 3 feet of water are allocated per acre. The area served by irrigation enterprises tends to be smaller as the water deliveries per acre are larger (table 4). Enterprises delivering up to 1 foot per acre supply an average area of about 15,000 acres. The service area declines with higher average water deliveries, until enterprises delivering over 3 feet per acre serve only slightly over 2,500 acres.

The water assessment for enterprises generally allocating less than 1 foot per acre averages \$1.14 per acre-foot. Water charges decline with increases in available water per acre, tending toward a minimum of about

ASSESSMENTS FOR WATER AND PERCENT OF AREA SERVED

By Irrigation Enterprises in South Platte Basin, Colorado, 1960

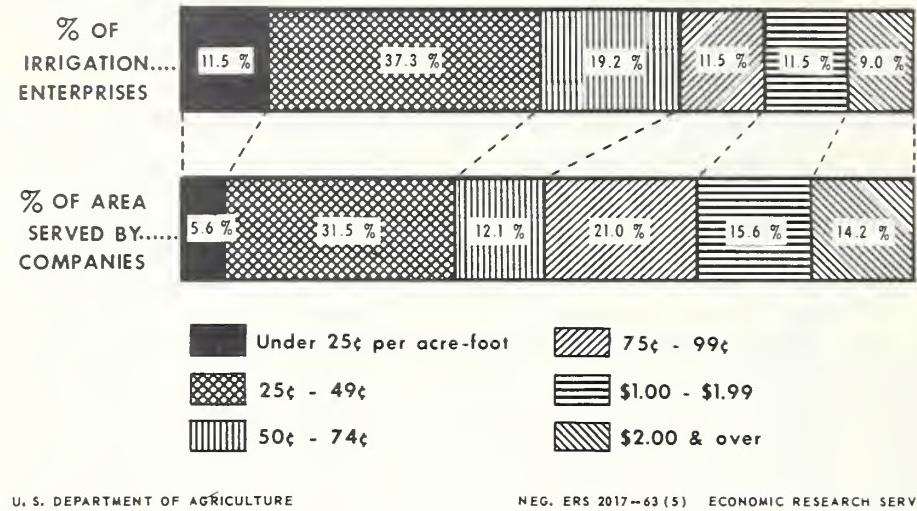


Figure 6

30 cents per acre foot. These estimates do not take into account water losses or gains that occur within the system or additional toll charges that may be imposed by some lateral companies. This figure applies only to water allocated to company stock or irrigation district lands, and not to NCWCD water.

Cost of Reservoir Company Water

Information on the cost of reservoir water is available only from separately organized reservoir companies. Twenty companies were in the study area, and cost data were available for 19 of them. To account for yearly variations in reservoir water availability, averages apply to the period 1950 to 1960. These reservoirs are operated by the same personnel operating the parent irrigation company. Operation and maintenance costs of the reservoirs are allocated to the reservoir stock by boards of directors of the reservoir and ditch companies (commonly overlapping) and the irrigation company secretaries.

The cost of reservoir water, based on recent annual assessments, ranged from 21 cents to \$6.49 per acre-foot released from the reservoir. The weighted average annual cost for the 19 reservoir companies reporting was \$2.05 per acre-foot delivered out of the reservoir (table 5).

Table 5.--Average cost of water and amount of water delivered by 19 reservoir companies, by range of costs per acre-foot, State Water Districts 1 - 6, South Platte Basin, Colo., 1950-1960

Cost per acre-foot	Average cost per company	Companies	Average annual deliveries for companies
	Dollars	Number	Acre-feet
Under \$1.00	0.47	1/ 8	72,812
\$1.00 - \$1.99	1.58	3	6,360
\$2.00 - \$2.99	2.44	3	1,969
\$3.00 - \$3.99	3.29	2	23,200
\$4.00 and over	6.41	3	20,102
Total or average:	2.05	19	124,443

1/ Users of water from one reservoir must pay running charges that vary in several companies.

The reservoir releases are used in comparing acre-foot costs of water because seepage and evaporation vary greatly from reservoir to reservoir and from year to year.

About 58 percent of the water delivered from separate reservoir companies was assessed at less than \$1 per acre-foot. Six percent of it carried assessments of \$1 to \$3 per acre-foot, and almost 35 percent of it was assessed at over \$3 per acre-foot.

There are substantial differences in the assessments made on reservoir water in the various water districts (table 6). Districts 4, 5, and 6 have costs below \$1 per acre-foot of water released. Most of the reservoirs in these districts are small; they are located near the streams and serve relatively small irrigation systems. Reservoirs in Districts 1 and 2 are located off the main stem of the South Platte River. Individual reservoirs in District 1 are fairly large, with capacities ranging from 14,000 to 33,000 acre-feet and assessments averaging \$1.05. In District 2, the reservoirs reported are smaller--1,400 to 3,000 acre-foot deliveries--with assessments averaging 74 cents per acre-foot. District 3 has the most reservoirs in the area and also the highest assessments per acre-foot of water released. Releases by individual reservoirs range from 1,120 to 14,500 acre-feet, with assessments ranging from \$1.40 to \$6.49 per acre-foot including running charges. The cost of reservoir water in the district averages \$4.96 per acre-foot.

Table 6.--Average annual water deliveries by reservoir companies and costs per acre-foot, State Water Districts 1 - 6, South Platte Basin, Colo., 1950-1960

State Water Districts	Average annual water deliveries	Average costs per acre-foot
	<u>Acre-feet</u>	<u>Dollars</u>
No. 1	71,535	1/ 1.05
No. 2	9,091	.74
No. 3	32,934	4.96
Nos. 4, 5, and 6 ..	10,883	.90
Total	124,443	---
	:	:

1/ There is a running charge on one-third of this water that is not included in the cost.

MARKET PRICES OF IRRIGATION COMPANY STOCKS

Ownership of mutual irrigation company stock is frequently transferred in the South Platte Basin. The majority of transfers occur when irrigated farms are sold. Most of the time, the stock is included in the sale; at other times the stock is priced separately. In the larger companies, there are occasional sales of stock among water users and also standing offers and bids. Officials in most irrigation companies were able to estimate market prices for stock in their companies, although some were able to give only par values.

The market prices quoted by company officials for irrigation company stocks ranged from \$10 per share delivering 2.5 acre-feet of water annually to \$15,000 for shares delivering 207 acre-feet. The stock in over 51 percent of the irrigation enterprises is valued at less than \$350 per share, but 20 percent are valued at over \$1,050 per share. Reservoir company stock ranges in value from \$25 to \$2,500 per share. Stock in sixty-four percent of the reservoir companies is valued below \$350 per share. About 18 percent are valued between \$350 and \$1,050, and almost 18 percent are valued above \$1,050.

A more meaningful comparison of irrigation company stocks is represented by the market value per acre-foot of water normally delivered on a share.

There is a wide range of values--from 75 cents to \$134--per acre-foot of water deliverable on irrigation company stock in the companies studied. The market price per acre-foot of water reflects: (1) The ability to supply adequate water throughout the growing season, (2) the availability of good land on which to apply the water, (3) the amount of capital invested in physical works of the company, and (4) the services provided in bringing the water to the farm. Companies serving large areas and with an adequate water

supply (around 2 acre-feet) have the highest stock values per acre-foot, while those with small service areas, even with ample water, have lower stock values.

The larger enterprises deliver irrigation water only during the growing season; they serve the better soil areas and have a large capital investment in reservoirs, ditches, and equipment. The smaller enterprises divert water continuously throughout a major part of the year, giving them large water allocations per acre, but they are located on poorer soils near the stream bottoms, serve a limited acreage, and typically have a small investment in physical works.

On the large systems, the water is delivered to the farm headgate by a ditchrider, and operation and maintenance is carried on by the company. On the smaller systems, the water users frequently operate the system and maintain the ditch with their own labor. These services, or lack of services, are reflected in the market price of the stock.

There are companies serving large areas where stock values per acre-foot of delivered water are relatively low. Conversely, there are companies with small service areas and high stock values per acre-foot of deliverable water. Many factors influence stock value in relation to water delivered, the more important ones being location, soils, date of water decrees, the amount of reservoir water needed, the cost of operating the system, and the amount of reconstruction and improvements that have been made on the system.

Table 7 shows a distribution of stock value per average acre-foot of water classified by service areas of the companies. This classification shows an upward trend in stock values per acre-foot of water as company service areas grow larger. This is mainly because transfer possibilities are greater. Also, many of the larger enterprises are somewhat short of stock for the area served so that there is a ready market for anyone who wants to sell shares. In most cases the deficiency is made up with water allotments from the NCWCD held by individual water users or by renting water. Water users prefer to own company stock when possible, because the yearly cost of company water is generally below NCWCD water, considering shrinkage and running charges.

The larger companies usually provide water users with a dependable supply of irrigation water during most seasons. However, those stockholders holding only 3 shares of stock per 40 acres when typical holdings are 4 shares per 40 acres will be short of irrigation water during most seasons. They will be forced to raise crops with low water requirements or will have to rent additional water.

Because of widely varying operating circumstances of irrigation enterprises in the South Platte area, it is very difficult to generalize about stock prices and values. The market value of irrigation water can represent the simplest type of structure with very little investment since the late 1800's, or it can represent a highly complex integrated irrigation system with numerous employees, many miles of ditches, 2 to 10 reservoirs, and several hundred farmer-stockholders.

Table 7.--Average market value per acre-foot of water deliverable on irrigation company stock by size of service area, 69 irrigation companies, South Platte Basin, Colo., 1960

Acres in service area of system	Companies	Average market value of stock per acre-foot of water deliverable
	<u>Number</u>	<u>Dollars</u>
999 and under	8	5.41
1,000 - 2,999	23	17.05
3,000 - 12,999	24	27.16
13,000 and over	14	40.23

SUMMARY EVALUATION OF IRRIGATION ENTERPRISES

Mutual irrigation companies in the South Platte Basin appear to be doing a satisfactory job of delivering irrigation water to their stockholders. Rental procedures and other water exchanges between companies are widely used to get the most efficient use of existing direct flow and storage water.

From an operational point of view mutual companies seem to be equally well suited to small- or large-scale operations. The quality of water service is an important factor affecting the annual cost of water to the water users. Some companies, of course, because of fortunate location and water rights, have lower operating costs than others.

Mutual companies appear to be responsive to the wishes of their water users--who are the owners and, in some cases, the operators of the system. The larger enterprises of necessity must hire technically qualified personnel to operate and maintain the system, while the medium and small systems have a variety of operating arrangements using both hired personnel and water-user labor.

Complexity of organization appears to have little influence on the operation of an irrigation system. Those systems that have several separate irrigation, lateral, and reservoir companies operating on a ditch appear to deliver water at approximately the same cost as systems where reservoirs and canals are organized as a single enterprise.

A notable example of consolidation does exist in the area, however. A number of small companies on Left Hand Creek in Boulder County combined to form the Left Hand Ditch Company. This company uses the creek channel as the main canal and operates the original ditches as laterals. This arrangement allows for integrated use of the combined decrees and the employment of a full-time superintendent to handle water deliveries and oversee operation and maintenance.

In general, however, there appears to be an overabundance of companies supplying water to irrigated lands in the basin. Some irrigation systems have several companies operating on the same ditch, making it necessary for water users to own stock in the main irrigation company, a lateral company, and one or more reservoir companies. Water users own varying amounts of these stocks. Some own mostly ditch stock; others own primarily reservoir stock. This arrangement creates variability in water supply to individual water users, complicated record-keeping, and problems of cost sharing among the companies operating on a single ditch.

There is also much duplication of physical works in the area. Many of the smaller systems could be combined into larger ditches with reduced conveyance losses, and with savings in costs of operation, maintenance, and land used for duplicate ditches. Prospects for reducing duplication seem dim, since it is difficult for companies on a single ditch to legally consolidate. Few independent companies can be expected to abandon their systems and join with other companies in forming larger, more efficient systems.

LITERATURE CITED

- (1) Anderson, R. L.
1961. The Irrigation Water Rental Market: A Case Study. Agr. Econ. Res. 8(2):54-58. April.
- (2) _____.
1961. Organizational Arrangements in Water Transfer. In Water Resources and Economic Development of the West. Conf. Proc., Com. on the Econ. of Water Resources Development, Rpt. 10. Portland, Oregon. December. pp. 1-8.
- (3) Hartman, L. M. and Anderson, R. L.
1962. Estimating the Value of Irrigation Water from Farm Sales Data in Northeastern Colorado. Jour. Farm Econ. 44(1): 207-213. February.
- (4) Hutchins, W. A.
1929. Mutual Irrigation Companies. U. S. Dept. Agr. Tech. Bul. 82. January.
- (5) _____.
1931. Irrigation Districts: Their Organization, Operation, and Financing. U. S. Dept. Agr. Tech. Bul. 254. June.
- (6) _____.
1936. Organization and Operation of Cooperative Irrigation Companies. U. S. Dept. Agr., Farm Credit Admin. Cir. C-102. August.
- (7) _____, Selby, H. E., and Voelker, S. W.
1953. Irrigation Enterprise Organizations. U. S. Dept. Agr. Cir. 934. October.
- (8) U. S. Bureau of the Census.
1962. U. S. Census of Agriculture: 1959. Vol. III, Irrigation of Agricultural Lands. U. S. Govt. Printing Off., Washington, D. C.



